

## INFLUENCE OF OBSERVATION POSTS ON TERRITORY SIZE OF NORTHERN SHRIKES

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ABSTRACT. — In male Northern Shrikes, impaling sites as a resource did not limit territory size as did hunting perches. After all posts and wire had been removed, the shrikes expanded their territories to pre-manipulated dimensions. The implications of this study for the family Laniidae are discussed. Received 19 March 1992, accepted 1 July 1992.

The territory sizes of male Northern Shrikes (*Lanius excubitor*) in the central Negev desert of Israel are resource dependent. The resource in this case is the number of observation/hunting posts which dictates the size of the territory defended. Male shrikes in this population reside permanently in breeding territories and some are polygynous (Yosef and Pinshow 1988). They cache prey at and around the most frequented observation posts and hunt almost exclusively from perches.

Following a decision of the county council, the loess plain upon which the settlement of Sede Boqer is located was fenced. The plan was implemented during the summer of 1989 and a 3 m high fence, with barbed wire at the top was built. The fence bisected the territories of three male shrikes that had been studied for three years (1987–1989) and whose boundaries were mapped (Yosef and Pinshow 1989). An almost instant change in the configuration of the territories was apparent. Also apparent was the fact that all three territories had shrunk in size. Following this observation, I hypothesized that impaling sites are a critical resource for male display to females (Yosef and Pinshow 1989) and that perch sites are a critical resource for hunting efficiency, dictating the size of the area defended. These hypotheses led to the predictions that territory size will decrease if (a) barbed wire is added and/or (b) posts are added. I tested the predictions by experimentally manipulating territories of male Northern Shrikes near Sede Boqer (34°47'N, 30°52'E, 475 m ASL), in the Negev Desert, Israel. This area is classified as arid, with 250–300 biological dry days per year and a precipitation to evaporation ratio of <0.2 (UNESCO 1977).

### METHODS

During September 1989, I mapped the territories of 14 male Northern Shrikes by observing their reactions to taped songs of other males (Miller 1931, Kridelbaugh 1982). In addition,

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I noted favored cache sites and verified that no fences traversed territories. All 135 perches available were annuals and bushes. Shrikes were captured with a bal-chatri noose trap (Clark 1968) and color banded for individual identification. Visual observations were made with 10 × 40 binoculars and a 20× telescope. Individuals on the fence-bisected territories of Sede Zin were not manipulated and were used as controls in order to verify that no changes in territory size occurred over the course of the study period due to seasonal changes or other unpredicted factors.

Random lots were drawn to decide which territories were to receive both fence posts and barbed wire and which would receive only posts with no additional (barbed wire) impaling facilities provided. During the first two weeks of October 1989, posts were planted 15 m apart and barbed wire stretched. Observations on changes in boundaries and impaling sites were made for the next six weeks. After all manipulated territories were remapped during the last week of November, all posts and barbed wire were removed and further observations were made until mid-December.

Results are expressed as means ± SD unless otherwise stated; groups were compared using paired *t*-test to check for differences in territory sizes before and after manipulation. I chose  $P < 0.05$  as the minimum acceptable level of significance.

#### RESULTS AND DISCUSSION

Over a period of 2–3 weeks, the male Northern Shrikes discovered the new perches and modified their territory boundaries and impaling sites. Males in territories with posts and barbed wire began impaling their prey on the barbed wire in the immediate vicinity of the posts. Males from territories that had posts but no barbed wire began hunting from the posts, and established new concentrations of impaling sites. These concentrations were mainly to be found near posts, in saltbushes (*Atriplex halimus*) whose tender branches had been fed upon by fat-tailed sand rats (*Psammomys obesus*), leaving a jagged edge which when dry became extremely sharp and then was used by shrikes for impaling. Although this indicated that my first hypothesis was disproven, and that impaling sites were not a resource limiting territory size, it remains possible that barbed wire may represent higher quality impaling sites to Northern Shrikes.

In late November 1989, all territories were remapped. Significant differences were found in areas defended by males before and after manipulation. All territories decreased in area ( $t = 9.2$ , 13 df,  $P = 0.0001$ ; Table 1). Males from territories in which both posts and barbed wire were introduced decreased the total area defended from an average of  $60.03 \pm 4.6$  ha to  $54.5 \pm 3.4$  ha ( $t = 6.9$ , 6 df,  $P = 0.0002$ ), and males that had only posts decreased their territories from an average of  $58.6 \pm 5.7$  ha to  $52.3 \pm 4.8$  ha ( $t = 6.0$ , 6 df,  $P = 0.0004$ ). This result illustrated that hunting perches in a given area are a limiting resource for male Northern Shrikes. This conclusion is further substantiated by results obtained in December. After all posts and wire had been removed, the shrikes expanded their territories to pre-manipulated dimensions. An A-B-A analysis showed that significant differences in territory size occurred between

TABLE 1  
TERRITORY SIZES (HA) OF NORTHERN SHRIKES BEFORE AND AFTER MANIPULATION AT SEDE  
BOQER, ISRAEL

	Manipulated territories			
	Initial	During	% Change	After
Posts and barbed wire:	56.9	54.8	3.7	56.3
	63.2	56.7	10.3	63.4
	67.1	59.9	10.7	67.2
	59.2	51.3	13.4	59.4
	52.7	49.6	5.9	52.3
	61.2	55.3	9.6	61.8
	59.9	53.6	10.5	59.6
Mean ± SE	60.0 ± 1.7	54.5 ± 1.3		60.0 ± 1.8
Posts only:	52.1	48.3	7.3	52.0
	66.3	57.1	13.9	65.9
	63.7	60.2	5.5	63.4
	54.6	50.1	8.2	54.5
	56.9	48.2	15.3	57.0
	53.2	48.6	8.7	53.6
	63.3	53.7	15.2	62.9
Mean ± SE	58.6 ± 2.2	52.3 ± 1.8		58.5 ± 2.1

the mean of the initial and after-manipulation territories and during the manipulation (Table 1). Territories with both fence posts and barbed wire (paired  $t$  value = 6.38, 6 df,  $P = 0.0007$ ) and territories with only fence posts (paired  $t$  value = 6.09, 6 df,  $P = 0.0009$ ) decreased significantly. For the duration of the study, no changes in the dimensions or configurations of control territories were observed ( $t = -1.136$ , 6 df,  $P = 1$ ).

The implications of this study for the family Laniidae could be far reaching. The Laniidae have exhibited a world-wide steady and unexplained decline (e.g., Bibby 1973, Bassin 1981, Tate 1986). The fact that in a given habitat it is possible to reduce the size of a shrike's territory by introducing suitable hunting perches could possibly allow for management practices that would augment local populations.

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## LITERATURE CITED

- BASSIN, P. 1981. Distribution and biotopes of the great gray shrike in northwestern Switzerland, Ajoie District, Canton of Jura. *Nos Oiseaux* 36:1-20.
- BIBBY, C. 1973. The red-backed shrike: a vanishing British species. *Bird Study* 20:103-110.
- CLARK, W. S. 1968. Modification of the bal-chatri trap for shrikes. *EBBA News* 30:147-149.
- KRIDELBAUGH, A. L. 1982. An ecological study of loggerhead shrikes in central Missouri. M.S. thesis, Univ. Missouri, Columbia, Missouri.
- MILLER, A. H. 1931. Systematic revision and natural history of the American shrikes (*Lanius*). *Univ. California Publ. Zool.* 38:11-242.
- TATE, J., JR. 1986. The Blue List for 1986. *Am. Birds* 40:227-236.
- UNESCO. 1977. Map of the world distribution of arid lands. MAB, Technical Note 7. UNESCO, Paris, France.
- YOSEF, R. AND B. PINSHOW. 1988. Polygyny in the Northern Shrike in Israel. *Auk* 105:581-582.
- AND ———. 1989. Cache size in shrikes influences female mate choice and reproductive success. *Auk* 106:418-421.